WATER PURIFICATION BY LIQUID CHLORINE

FOR SMALL COMMUNITIES

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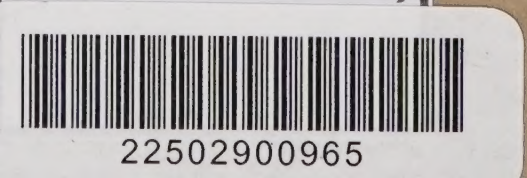


WATER PURIFICATION BY LIQUID CHLORINE FOR SMALL COMMUNITIES

THERE are three general processes of water purification: *first*, sedimentation or storage; *second*, filtration; and *third*, sterilization. Large impounding reservoirs or settling basins typify the first process, extensive and elaborate filtration works the second, while the third process is represented in its highest state of development by the Wallace & Tiernan chlorine control apparatus.

Some waters require all these processes for proper purification, some only two. But all water supplies at times require sterilization in order to make their potable use entirely safe.

Sedimentation and filtration, when properly operated, remove color and turbidity and also a large proportion of the bacteria or germ life. Sterilization destroys *all* germ life and is thus a necessary adjunct to the settling basin or filter. In cases where removal of turbidity or color is not required, sterilization is the only treatment needed to ensure a safe water supply.

Practically every source of water is subject to pollution. The pollution may be continuous or only

occasional, but at some time or other nearly every water supply is polluted. If the pollution is from human beings and the germ life entering the water is not destroyed the consumers are subject to the potential danger of intestinal diseases such as typhoid fever or dysentery. The surest, safest, and cheapest way to destroy this germ life is by the process of sterilization.

It is generally acknowledged by scientific men that the most satisfactory method of sterilization is by the process of chlorination—that is, by adding to the water to be treated minute quantities of chlorine or its compounds. The process is a development of comparatively recent date, the first recorded attempt to sterilize water by chlorination in this country being made in 1906. Since then extension has been rapid.

The chlorine compound used at first was calcium hypochlorite or 'chloride of lime' but its utilization was so disagreeable and its uniform application so difficult that the use of pure chlorine in liquid state was inaugurated, and the requisite control apparatus devised.

Some of the specific advantages of liquid chlorine over chloride of lime may be briefly discussed.

In the first place liquid chlorine is an absolutely pure chemical. It is usually placed on the market in

small cylinders which require very little space for storing, while chloride of lime is very bulky.

The disagreeable odors and corrosive effects of chloride of lime are absent in the use of liquid chlorine, when controlled by efficient apparatus.

Chloride of lime deteriorates rapidly, whereas liquid chlorine retains its full efficiency indefinitely. This is one of the greatest advantages to be derived from the use of liquid chlorine, especially for small installations.

Under working conditions, due to necessary waste of bleach, one pound of liquid chlorine is equal in sterilizing value to eight pounds of chloride of lime. The sterilization is also more uniform.

Water treated with liquid chlorine is less liable to taste or odor, due to the more accurate control possible.

The liquid chlorine apparatus is far more compact than the installation for chloride of lime.

The liquid chlorine process is applicable under any conditions and all pressures. It is adapted to remote control. The gas can be controlled by automatic feed.

With liquid chlorine the freezing difficulties encountered in the use of chloride of lime are entirely obviated.

As between the two sterilizing agents, the costs of

chemicals are about the same, but the costs of installation and operation are greatly in favor of liquid chlorine.

The application of liquid chlorine to the water to be purified is, however, ordinarily fraught with difficulties arising from the very activity of the gas itself. Though very real, these difficulties are entirely overcome in the design and construction of the control apparatus manufactured by Wallace & Tiernan—the only appliances on the market at the present time adequate to meet all the requirements of handling chlorine in the liquid or gaseous state for the purification of water.

MANUAL CONTROL CHLORINATOR

There is set forth in this booklet a description of the Wallace & Tiernan manual control chlorinator, solution Feed, Type A, one of the ten types of apparatus manufactured by this company. This type is particularly suitable for small daily flows of water and will be of interest to superintendents, chemists, and managers of waterworks in the smaller municipalities.

Messrs. Wallace & Tiernan especially invite consideration, by engineers and others interested in water purification, of the details of design and the perfection of mechanical construction.

METHOD AND APPARATUS

Chlorine gas, compressed to liquid state in steel cylinders holding a hundred pounds, is controlled and measured by the apparatus and introduced into the water in the proper proportion to effect sterilization.

The extremely small amounts of chlorine required to destroy the germ life do not alter in the slightest degree the chemical or physical characteristics of the water. The germ life is destroyed—otherwise the water remains the same.

ADVANTAGES IN CONSTRUCTION

There are many advantages in the construction and design of all Wallace & Tiernan apparatus to which especial attention is directed.

Simplicity in Design. There are no moving parts to get out of order or adjustment.

Compactness. Shipment by express is easy and inexpensive. The apparatus can be sent completely assembled, ready for operation. Installation is a matter of hours and minutes—not of weeks and days. The apparatus may be installed at any convenient point on the premises and the chlorine piped to point of application.

Portability. The weight of the apparatus is less than one hundred pounds.

Meters Hydraulic in Principle. All chlorine meters operate on the hydraulic principle. There are no moving mechanical parts to cause friction, wear, or strain. If the meter indicates at all, it indicates correctly.

Empirical Calibration. The chlorine meter on every apparatus is empirically calibrated, and then checked during the efficiency test.

Visibility. All chlorine flow meters and orifices are entirely visible, making it possible to actually see at all times that the meter is working perfectly in every detail, and is clean and free from deposit. This point cannot be over-emphasized.

Dry Control Parts. All control parts of the apparatus are kept perfectly dry, thus avoiding corrosion—for it is only in the presence of moisture that chlorine is so extremely corrosive.

Constant Drop in Pressure. Each type of apparatus has a differential pressure reducing valve which maintains a constant drop in pressure across the chlorine control valve. This produces a constant flow of chlorine for any setting of the control valve regardless of varying pressures in the chlorine cylinders or of varying back pressures from the water being treated. A change in static head in either the system of chlorine apparatus or water in no way affects this predetermined drop across the control

valve. This drop being about a pound allows a considerable opening of the control valve for comparatively low flows of chlorine. Thus, dangers of stoppage are minimized.

Special Materials. Special metals and materials, such as platinum, glass, silver, tungsten, and alloys particularly adapted for chlorine control work are used where best suited to the needs in question.

Finish. Parts are finished in silver plate and black enamel.

Interchangeable Parts. The apparatus is built on the unit system and all parts are perfectly interchangeable.

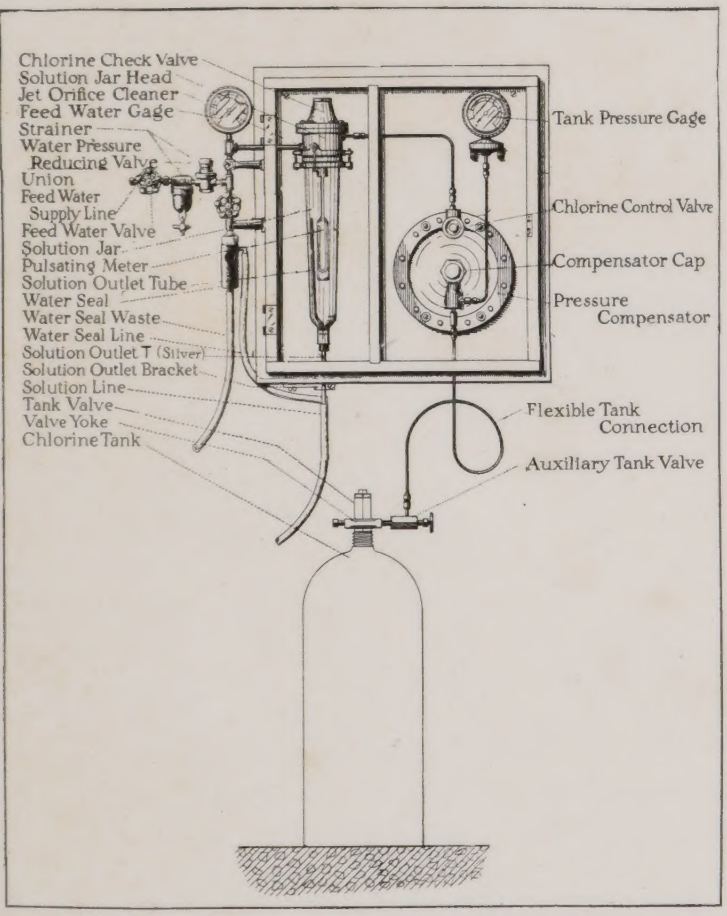
Workmanship. The highest class of workmanship is employed in making all parts of the apparatus. Each apparatus, before shipment, is given an actual chlorine run by experts who have actually installed and operated chlorine plants on water and sewage treatment.

Guarantee. All apparatus is guaranteed against inherent mechanical defects for a period of one year.

DESCRIPTION OF APPARATUS

Chlorine gas from the chlorine tank, regulated by the chlorine control valve, is introduced through the chlorine check valve and meter into the chlorine solution jar, and water is at the same time introduced through the solution jar head. The resulting solution is piped through the chlorine solution line to the point of application. When the chlorine solution is introduced into a suction line under negative head, a water seal is provided to prevent air being drawn into the suction line.

The function of the pressure compensator is to take care of varying pressures in the chlorine tank and also to maintain a constant drop in pressure across the chlorine control valve.


Chlorine Check Valve
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Feed Water Gage
Strainer
Water Pressure Reducing Valve
Union
Feed Water Supply Line
Feed Water Valve
Solution Jar
Pulsating Meter
Solution Outlet Tube
Water Seal
Water Seal Waste
Water Seal Line
Solution Outlet T (Silver)
Solution Outlet Bracket
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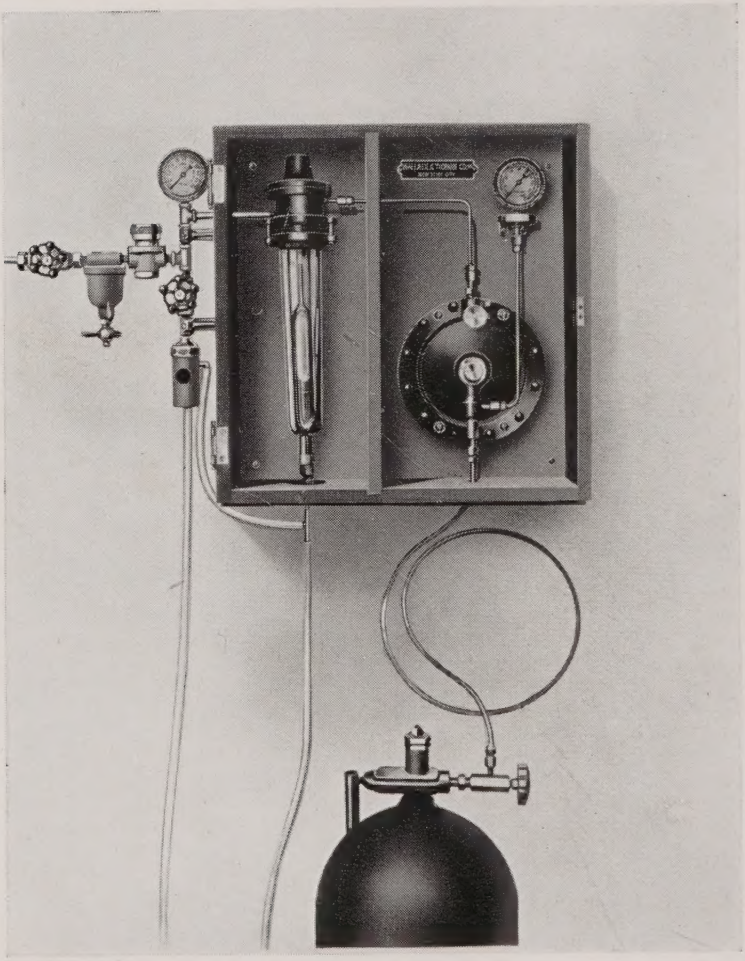


In the treatment of water a chlorine flow meter, to be reliable, must give a constant rate—not per day, nor per hour, nor per minute—but even less than per second, for the obvious reason that the water is flowing constantly and must receive its chlorine constantly and not intermittently.

The chlorine solution jar and pulsating meter are made of special annealed glass. They are consequently absolutely unattacked by the chlorine solution. Furthermore, the flow of chlorine can be actually seen no matter how small. A flow of one pound of chlorine per twenty-four hours (which amount will treat 300,000 gals. of water) is a flow of .000694 lbs. per minute or .0000115 lbs. per second. This quantity is entirely too minute to measure by any method but a volumetric one.

The type meter used will indicate accurately from 1/10 lb. of chlorine per 24 hours (.00000115 lbs. per second) up to 12 lbs.

One pulsation of the meter gives 100 milligrams or 1/4534 lbs. (.00022 lbs.). By simply timing the number of pulsations per minute, and using the chart of operation furnished with the apparatus, the desired flow of chlorine can be easily and accurately set.

The operation of this meter is fully described and illustrated on pages 12–13.

A small meter operating on the same general

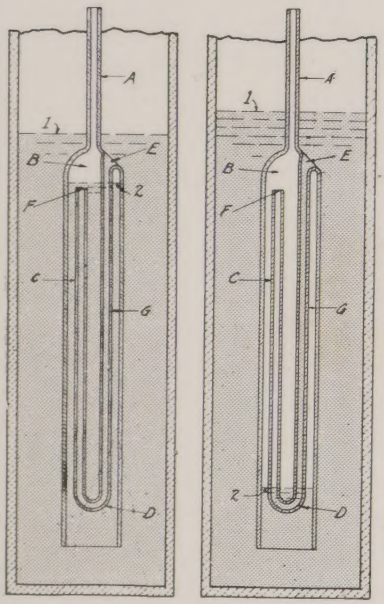
principle which will indicate accurately flows as low as 1/100 lb. chlorine per 24 hours (.000000115 lb. per second) can be furnished on request, thus making the apparatus suitable for the smallest water supplies.

A ready solubility of chlorine is secured by the action of a water jet which thoroughly churns up the chlorine and water in the jar.

DESCRIPTION OF PULSATING METER

The meter *A* in the chlorine absorption chamber is shown in detail and principle in the drawing on the opposite page. View *X* shows the water level 2 in the meter at the beginning of the pulsation, and view Y shows the water level 2 just before the siphon *C-G* breaks at *D*, which completes one pulsation of the meter.

Its operation is as follows. When the downward flowing gas in *A* reaches the point *D*, it will rush up through the tube *G* of the siphon, and the bell or compartment *B* will refill with water up to the upper end of *C*. This completes one pulsation or measure of the meter, and the amount of gas delivered by this one pulsation is, of course, the capacity of the compartment *B* between the points *F* and *D*.



X Y

This is a volumetric meter, hydraulic in principle, and if it operates at all it must operate correctly. Its reading is accurate from a minimum of 1/10 lb. to a maximum of 12 lbs. per 24 hours.

All the openings are large so that there is no danger of stoppage. All parts are of glass, which is in no way affected by the chlorine solution. Furthermore, this plan of construction enables the attendant to actually see the chlorine flowing, no matter how small the amount. This point is essential in reliable chlorine control work.

COST OF OPERATION

It has been our experience, with nearly one thousand installations of our apparatus in cities and towns in the United States, Cuba, Canada, and Mexico, that with a water low in turbidity and color a dose of 2/10 parts of chlorine per million is ample to secure satisfactory destruction of germ life. This dose is equivalent to 1.66 lb. chlorine per million gallons of water treated.

A fair average pre-war figure for the price of liquid chlorine throughout the United States, under normal conditions, is ten cents per pound on the job. On this basis, it is evident that with a water low in turbidity and color the germ life can be destroyed for less than 17 cents a million gallons. Surely this is a good investment for any community and offers the cheapest and surest form of insurance against all danger of water-borne disease epidemics.

In cases where the water to be treated has a high turbidity or color, the amount of chlorine required is somewhat higher, but it is very rarely that the cost of treatment exceeds 45 or 50 cents per million gallons.

There is no labor charge involved in operating the apparatus other than that of removing an empty

chlorine cylinder and attaching a full cylinder. As this work can be done in two or three minutes and is necessary only at rare intervals the cost is so slight as to be negligible.

The apparatus described can be erected by any capable mechanic without difficulty in one or two hours. The apparatus with necessary connections is shipped complete, and full directions for installation and operation accompany shipment.

If you are interested in making the water supply of your community absolutely safe, we will gladly quote you prices on this apparatus upon receipt of detailed information concerning your conditions. The data can conveniently be given on the accompanying blank.

Upon request we will gladly send our complete treatise, *Chlorine Control Apparatus for Water and Sewage Purification.*

WALLACE & TIERNAN CO., INC.,
137 CENTRE STREET NEW YORK

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